

Flow Injection Techniques for Environmental Monitoring



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Flow Injection Analysis (FIA) has made a significant impact on Analytical Chemistry in the quarter century since its inception and for much of that period the *Journal of Flow Injection Analysis (JFIA)* has kept its readership singularly well informed of developments.

The fact that there are 10,000 publications on FIA (and related techniques such as sequential injection analysis) is a testament to its importance. FIA has contributed to the development of rapid analytical methods, particularly in the environmental and biomedical/biotechnological fields, and facilitated the application of a wide range of detection techniques and on-line physical and chemical sample treatment procedures.

In spite of the pivotal role that FIA has played in laboratory automation, it is perhaps surprising that it has not become more widely used in industrial process analysis and in situ environmental monitoring. There are, of course, legitimate questions about the reliability of pumping systems, the volumes of wet chemical reagents required and the lack of off-the-shelf solutions to particular analytical problems. However there are also examples of robust and thoroughly validated FIA methods for field and process applications to suggest that the approach has considerable merit.

Within the environmental area the key attractions are the high temporal and spatial resolution data that can be obtained with remotely deployed (eg. shipboard, submersible) FIA instrumentation. Systems can also be designed to be

specific for a particular analyte in a particular matrix and contamination can be minimised by the self-enclosed nature of the system. Automation of instrument operation and data processing are relatively straightforward and low cost, remote interrogation of the instrument is possible with modern communication technology.

A good example of the analytical capability of the FIA for remote environmental monitoring is the determination of dissolvable iron in the open ocean at sub nanomolar levels using flow injection with chemiluminescence detection (FI-CL). Iron is now recognised as a rate limiting nutrient in some of the world's seas (most notably the Southern Ocean) and in 1999 an iron enrichment experiment (SOIREE) was carried out in this harsh and physically demanding environment. The ocean was seeded with ten tonnes of iron sulphate and a shipboard FI-CL system (see *Analytica Chimica Acta* 361 (1998) 189) was used for underway mapping of sub-nanomolar iron concentrations as the plume dispersed and iron was taken up by biota. The SOIREE experiment has recently been published in *Nature* (Volume 407, 12 October 2000) and FI-CL was the key analytical technique that made it possible.

We all value and appreciate the service that JFIA provides for the Flow Analysis community and I hope that it will prosper in the coming decade, one which I also expect the potential of FIA for remote environmental and process monitoring to be fully realised.